USDA Natural Resources Conservation Service

Ecological site F152BY012TX
Well Drained Bottomland

Last updated: 9/22/2023
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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 152B–Western Gulf Coast Flatwoods

Major Land Resource Area (MLRA) 152B, Western Gulf Coast Flatwoods, is in eastern Texas and western Louisiana. Locally termed the Flatwoods, the area is dominated by coniferous forest covering 5,681 square miles (14,714 square kilometers). The region is a hugely diverse transition zone between the northern and eastern mixed forests and southern and western coastal prairies and grasslands.

Classification relationships

Major Land Resource Area (MLRA) (USDA-Natural Resources Conservation Service, 2006)

Ecological site concept

The Well Drained Bottomland ecological site has well drained soils in bottomlands found adjacent to waterways. The sandy and loamy soils drain water quickly from the site, but their proximity to flood-prone waterways creates a unique mixture of plant species. The plants are adapted to withstand flooding and dryness because of the rapid permeability.

Associated sites

F152BY013TX	**Poorly Drained Loamy Bottomland** Soils are poorly drained and on a lower landform.
F152BY014TX	**Poorly Drained Clayey Bottomland** Soils are clayey throughout and poorly drained.

Similar sites

F152BY009TX	**Sandy Terrace** Soils are on a higher landform.
F152BY014TX	**Poorly Drained Clayey Bottomland** Soils are poorly drained and clayey throughout.
F152BY013TX	**Poorly Drained Loamy Bottomland** Soils are poorly drained and on a lower landform.

Table 1. Dominant plant species

Tree	(1) *Pinus taeda* (2) *Fagus grandifolia*
Shrub	(1) *Carpinus caroliniana*
Herbaceous	(1) *Arundinaria tecta* (2) *Chasmanthium latifolium*

Physiographic features

The ecological site includes areas on flood plains. Slope ranges from 0 to 3 percent. Elevation ranges from 20 to 150 feet. A water table exists from November to April from 12 to 62 inches.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Flood plain > Bar
Runoff class	Negligible
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	6–46 m
Slope	0–3%
Water table depth	30–157 cm
Aspect	Aspect is not a significant factor

Climatic features

The Western Gulf Coast Flatwoods (MLRA 152B) is within the humid subtropical climate zone. The region boasts one of the highest rainfall averages in the southern United States, over 60 inches (152 centimeters) annually. This is due to the gulf currents that carry humid air to the region, where it condenses and precipitates. Rainfall averages are fairly consistent month by month, ranging from the lowest of 3.5 inches (8.9 centimeters) in March and the highest of 5.6 inches (14.3 centimeters) in June.

The area is prone to severe thunderstorms and tornadoes when the proper conditions exist, generally in the springtime. Sometimes excessive rainfall occurs, leading to flooding. Hurricanes also strike the region, generally in late summer or early fall. These extreme weather events can be quite destructive, toppling trees, and serves to naturally reset the vegetation to primary succession. The higher humidity of the region amplifies the feeling of heat during the summer. Prolonged droughts and snowfall events are rare.

Table 3. Representative climatic features

Frost-free period (average)	249 days
Freeze-free period (average)	289 days
Precipitation total (average)	1,600 mm

Climate stations used

- (1) DE QUINCY [USC00162361], Dequincy, LA
- (2) LIBERTY [USC00415196], Liberty, TX
- (3) ELIZABETH [USC00162800], Oakdale, LA
- (4) CLEVELAND [USC00411810], Cleveland, TX
- (5) WILDWOOD [USC00419754], Kountze, TX
- (6) LUMBERTON [USC00415435], Silsbee, TX
- (7) TOWN BLUFF DAM [USC00419101], Jasper, TX
- (8) DE RIDDER [USC00162367], Deridder, LA
- (9) OBERLIN FIRE TWR [USC00166938], Oberlin, LA
- (10) ORANGE 9 N [USC00416680], Orange, TX

Influencing water features

The soils on this site are moderately well to well drained but flood for short intervals throughout the year, mainly in the winter and early spring. The soils are classified as non-hydric.

Wetland description

The soils associated with this site are non-hydric. In most areas, the adjacent soils are hydric. These soils are flooded for long periods, or stay wet for long periods. Onsite investigation is needed to determine the local conditions.

Soil features

The soils consist of very deep, moderately well drained and well drained soils formed from sandy sediments and loamy alluvium. Hatliff and Voss are the representative series and are classified as a coarse-loamy, siliceous, active, thermic Fluventic Dystrudept and a mixed, thermic, Oxyaquic Udipsamment, respectively. As with soils that are entisols and inceptisols, extensive horizon development has not occurred. The horizons are generally separated by a change in color as their textures are similar throughout the entire profile. The subsurface is saturated for at least 20 consecutive days, or 30 cumulative days throughout the year.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Sand (2) Fine sandy loam
Family particle size	(1) Coarse-loamy (2) Sandy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately rapid to rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-152.4cm)	5.08–17.78 cm
Calcium carbonate equivalent (0-152.4cm)	0%
Electrical conductivity (0-152.4cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0–2
Soil reaction (1:1 water) (0-152.4cm)	5.6–7.3
Subsurface fragment volume <=3" (0-152.4cm)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The information in this ecological site description (ESD), including the state-and-transition model (STM), was developed using archeological and historical data, professional experience, and scientific studies. The information is representative of a complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals, and ecological processes are described to inform land management decisions.

Introduction – In southeastern Texas and southwestern Louisiana the transition from coastal grasslands to the large expanse of coniferous forest has been deemed the “Flatwoods”. As the name suggests, the region is relatively flat and, with many transitional areas, highly diverse in flora and fauna. Historically, the area was covered by pines with mixed hardwoods, sparse shrubs, and a diverse understory of grasses and forbs. Fire and drainage patterns play a significant role in shaping the plant communities and their development. Fire suppression, drainage alterations, and land conversion have reduced the amount of historical communities in existence today.

Background – Prior to settlement by the Europeans, the reference state for the Well Drained Bottomlands were Loblolly Pine/American Beech Forests. Remnants of this presumed historic plant community still exist where natural conditions are intact. Evidence of the reference state is found in accounts of early historic explorers to the area, historic forest and biological survey teams, as well as recent ecological studies in the last 30 years. The age of this community varies, and has a diverse flora.

Settlement Management – As human settlement increased throughout the area, so did the increase in logging and grazing by domestic livestock. The logging became so extensive that by the 1930’s most of the region had been cut-over. Replanting trees to historic communities was not common and early foresters began planting loblolly pine (*Pinus taeda*) for its quick growth. As more people colonized they began suppressing fire, which allowed dense thickets of shrubs to replace the herbaceous understory.

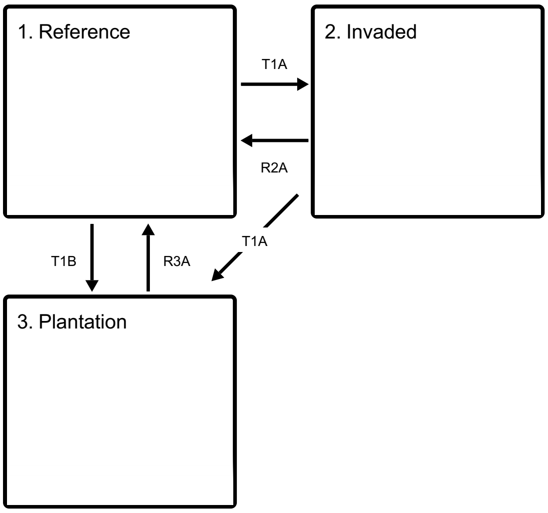
Current Management and State – Today much of the historic forest is gone, replaced by pine plantations, crops, and pastures. The areas that were not converted have been fire-suppressed so long that loblolly pine and fire intolerant hardwoods populate the overstory structure. Currently, federally-managed properties are the best place to view the remnant sites (National Park Service, U.S. Fish and Wildlife Service, etc.). Some private individuals have begun restoring communities through selective tree planting and retention of communities that remain. Other restoration efforts include mimicking natural-disturbance regimes through gap-phase regeneration on plantation sites.

Fire Regimes – Fire was a natural and important disturbance throughout the region. Fire occurred naturally from lightning strikes, by Native Americans for game movement, and eventually early European settlers. Fires throughout the Flatwoods occurred at two different times. Early in the year, they would occur during late winter and early spring, removing senescent vegetation, recycling nutrients and minerals, and spurring new plant growth. Late summer and early fall fires occurred as well, but with a different community effect. Summer fires burned hotter and with more intensity, greatly suppressing the shrub canopy layer. The summer fires also shifted the ecological site transitional state by decreasing grass densities and increasing forb densities. The topography, fuel loads, and other conditions caused patchy burns throughout the region resulting in mosaic patterns of plant communities and a heterogeneous landscape.

Disturbance Regimes – Extreme weather events occur occasionally throughout the region. Tornados uproot trees and open canopies in the spring months. In the late summer and early fall, hurricanes or tropical depressions can make landfall, dumping excessive amounts of rain and toppling trees with high winds. Another cause of large canopy openings is the effects of the southern pine beetle (Dendroctonus frontalis). Starting in the late 1950's, beetle outbreaks have occurred every 6 to 9 years (although a major attack has not occurred in some time); usually when the trees are stressed due to multiple environmental factors.

State and transition model

Ecosystem states



T1A - Introduction of non-native Chinese tallow

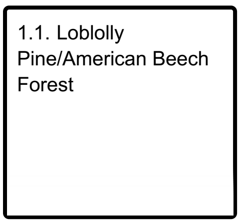
T1B - harvested by clearcut and planted monoculture of pine or hardwood trees.

R2A - Mechanical and chemical removal of Chinese tallow

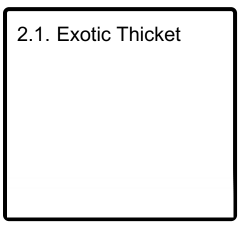
T1A - harvested by clearcut and planted to a monoculture of pine or hardwood trees

R3A - Selective harvest coupled with reintroduction of native species

State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities

3.1. Pine/Hardwood Plantation

State 1
Reference

The Well Drained Bottomland is a Loblolly Pine/American Beech Forest. The deep well drained sandy and loamy soils are rapidly permeable. This is unique because the sites receive flood water, but the site does not stay saturated for lengthy periods. Plants that are adapted to flooding, as well as lengthy dry periods, inhabit these bottomlands. Fires are infrequent to the area, estimated between 10 and 20 years when the surrounding uplands burn or dry conditions exists. The sites generally have moderate to heavy overstory canopy ranging from 75 to 95 percent. Basal areas area high, ranging from 85 to over 115 square feet per acre.

Dominant plant species

- American beech (*Fagus grandifolia*), tree
- loblolly pine (*Pinus taeda*), tree

Community 1.1
Loblolly Pine/American Beech Forest

The overstory canopy is dominated by loblolly pine and American beech. Sweetgum (*Liquidambar styraciflua*), blackgum (*Nyssa sylvatica*), and water oak (*Quercus nigra*) are common and an occasional swamp chestnut oak (*Quercus michauxii*) will be mixed in. Shrub species can vary, but American hornbeam is prolific, with eastern baccharis (*Baccharis halimifolia*) and witchhazel (*Hamamelis virginiana*) mixed in. Since the overstory canopy is somewhat closed, grass and forb species can be sparse. Thick stands of switchcane and broadleaf uniola will be present nearest the waterway where more sunlight exists. These species also stabilize the soil with their roots.

State 2
Invaded

Chinese tallow (*Triadica sebifera*) is an undesired, invasive species brought to the United States in 1776 (Randall and Marinelli, 1996). Rapid expansion along the gulf coastal states has allowed the species to invade many ecosystems and consequently reduce diversity. Tallow trees are known to cause gastrointestinal upset, contact dermatitis, and toxicity in livestock and humans. Mechanical and chemicals options exist as a means to control the trees.

Dominant plant species

- Chinese tallow (*Triadica sebifera*), tree

Community 2.1
Exotic Thicket

Chinese tallow invade the ecological site via flooding events as nearby waterways transport seeds. Once settled, the seeds produce saplings viable to reproduce seeds in as little as three years. The rapid establishment immediately blocks sunlight to understory species and reduces diversity. Unabated growth quickly allows the saplings to grow into the overstory, thus changing the ecological state entirely. Reductions in size and number of all vegetative species are seen in all canopy tiers.

State 3
Plantation

The Plantation State is a result of conversion activities. The landowner has maximized silviculture production by planting a monoculture of pine or hardwood species.

Community 3.1
Pine/Hardwood Plantation

In the immediate years following the initial plantation tree planting, the understory community will resemble the reference state (State 1). During this early growth period, the landowner will typically remove unwanted hardwoods and herbaceous plants to reduce competition with the planted pine trees. As the overstory canopy closes, less understory management is required due to sunlight restrictions to the ground layer.

Transition T1A
State 1 to 2

The transition from State 1 to State 2 is a result of occupancy by Chinese tallow or other noxious weeds. Invasive plants outcompete, and eventually choke out, all other native species.

Transition T1B
State 1 to 3

The transition is due to the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut, the site prepared and planted to a monoculture of pine or hardwood trees.

Restoration pathway R2A
State 2 to 1

The driver for restoration is control of Chinese tallow. Although an option, mechanical removal of the trees is difficult because they readily regrow from roots and seeds. Several chemicals methods are available including glyphosate for cut-stump treatments, triclopyr for cut-stump and foliar treatments, imazamox for broad spectrum application, and imazapyr as a foliar spray. Many aquatic herbicides have water use restrictions and can potentially kill hardwoods, so labels and restrictions should be read carefully prior to application.

Transition T1A
State 2 to 3

The transition is due to the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut. Then, the site is prepared and planted to a monoculture of pine or hardwood trees.

Restoration pathway R3A
State 3 to 1

When restoring a plantation, the land manager can either clearcut the timber and begin as in the previous example. Otherwise, gap-phase regeneration is possible through selective timber harvests. This involves replanting the desired overstory species in small openings within the current structure of the woodland. The benefit is a slow progression of restoration instead of starting from primary succession.

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
sweetgum	LIST2	*Liquidambar styraciflua*	Native	–	–	–	–
loblolly pine	PITA	*Pinus taeda*	Native	–	–	–	–
blackgum	NYSY	*Nyssa sylvatica*	Native	–	–	–	–
swamp chestnut oak	QUMI	*Quercus michauxii*	Native	–	–	–	–
water oak	QUNI	*Quercus nigra*	Native	–	–	–	–
American beech	FAGR	*Fagus grandifolia*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
switchcane	ARTE4	*Arundinaria tecta*	Native	–	–
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	–
longleaf woodoats	CHSE2	*Chasmanthium sessiliflorum*	Native	–	–
needleleaf rosette grass	DIAC	*Dichanthelium aciculare*	Native	–	–
panicgrass	PANIC	*Panicum*	Native	–	–
Forb/Herb					
St. Andrew's cross	HYHY	*Hypericum hypericoides*	Native	–	–
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	–	–
violet	VIOLA	*Viola*	Native	–	–
Fern/fern ally					
western brackenfern	PTAQ	*Pteridium aquilinum*	Native	–	–
Shrub/Subshrub					
eastern baccharis	BAHA	*Baccharis halimifolia*	Native	–	–
American hornbeam	CACA18	*Carpinus caroliniana*	Native	–	–
American witchhazel	HAVI4	*Hamamelis virginiana*	Native	–	–
Tree					
red maple	ACRU	*Acer rubrum*	Native	–	–
American holly	ILOP	*Ilex opaca*	Native	–	–
sweetbay	MAVI2	*Magnolia virginiana*	Native	–	–
Vine/Liana					
saw greenbrier	SMBO2	*Smilax bona-nox*	Native	–	–
laurel greenbrier	SMLA	*Smilax laurifolia*	Native	–	–
roundleaf greenbrier	SMRO	*Smilax rotundifolia*	Native	–	–

Wood products

This soil occurs in the Woodland Suitability Group 2w8 and has a high potential for woodland management, both pine and hardwood. The 50-year site index for loblolly pine averages 95 feet (approximately 62 feet on a 25-year curve). For bottomland oaks it averages 85 feet. The yield from an unmanaged, natural stand of loblolly pine, over a 50-year period, is approximately 390 board feet (Doyle Rule), 3.12 tons, or 100 cubic feet per acre per year. Although management can substantially increase this yield, it should also include attention to streamside management zone considerations to protect water quality. Access and equipment operability on these soils is poor during wet periods due to flooding. Harvesting and other operations may need to be suspended during such periods. Flooding also makes these soils poorly suited for log landings and roads. Road construction should be limited. When these soils are wet their low strength will lead to severe rutting problems. Site preparation operations should be limited to the dry months and planting should be planned for the drier part of the planting season. Use of herbicides for site preparation must also take into consideration the possibility for flooding in order to prevent the possible contamination of surface water.

Type locality

Location 1: Hardin County, TX	
UTM zone	N
UTM northing	30.5230556
UTM easting	-94.346027
General legal description	Big Thicket National Forest – Turkey Creek Unit

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Contributors

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Approval

Bryan Christensen, 9/22/2023

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	09/21/2021
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not**

invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

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17. **Perennial plant reproductive capability:**
